calibration. The procedures available for making such a calibration are by no means limited to the Carnot cycle; nor is it necessary to place any reliance on a temperature scale defined by Eqs. (1) and (2).

Since the perfect gas Carnot cycle argument is used in many texts to establish $T=\theta$, it seems appropriate to conclude with a reminder of a viewpoint which avoids the difficulties of Miller and Dennis. The essential point is that the only pertinent issue is the relation between θ and the *practical* ideal gas scale (PIGS). We recall that the PIGS has the following operational definition.

$$T=273.16^\circ \lim_{P\to 0}(P/P_3), \quad \text{(at constant v)}.$$

(We retain Miller and Dennis' T symbol and refer the unfamiliar reader to Zemansky[3] for a complete discussion of this definition.) The PIGS definition together with the first law permits us to independently verify Eqs. (1) and (2) as experimentally valid properties of real gases in the limit of low density. Thus both Eqs. (1) and (2) may be employed in the Carnot cycle argument, not as defined properties, but as logical experimental extensions of the PIGS definition. When approached from this standpoint the extraneous question of the minimum number of defining equations does not arise.

The writer is pleased to acknowledge discussions with several colleagues on the subject of this note. Special thanks are due to R. J. Maurer for his comments.

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[1] D. G. Miller and W. Dennis, Am. J. Phys. **28**, 796 (1960).
[2] In its usual context the subject derivation occurs after the Carnot theorem but before the Clausius theorem. Thus the analysis must be done without the analytic formulation of the second law which, in the traditional approach, is established by the Clausius theorem.
[3] M. W. Zemansky, *Heat and Thermodynamics* (McGraw-Hill Book Company, Inc., New York, 1957), 4th ed., Chap. 1.

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ANNOUNCEMENTS AND NEWS

Erratum: Length Contraction Paradox

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[Am. J. Phys. 29, 365 (1961)]

In the above article, the word *internal*, appearing in the second line above the figure, should be changed to *inertial*.

New Forms of Graduate Record Examination Advanced Physics Test

Educational Testing Service has announced that new forms of the Graduate Record Examination Advanced Physics Test will be introduced during the academic year 1961–62. These examinations have been prepared in consultation with a committee consisting of Henry Foley, Columbia University, Newell Gingrich, University of Missouri, Robert Hulsizer, University of Illinois, R. Bruce Lindsay, Brown University, and Walter Michels (chairman), Bryn Mawr College. It is hoped that these forms will serve as better predictors for success in graduate work than have the forms of the examination used in past years. Recent changes in the nature of graduate work have been taken into account, and experience with recently developed testing techniques has been utilized in their construction.

The subject matter content of the new examinations will be limited to those fields which the committee, with the advice of outside consultants, has come to believe to be most important to the beginning graduate student. Approximately 15% of the items will be concerned with each of the following four fields: classical mechanics, basic electricity and magnetism, atomic physics, and physical optics and wave phenomena. The remaining 40% of the items will be divided among: electrical measurements and electronics, nuclear physics, introductory wave mechanics, special relativity, and thermodynamics and classical statistical mechanics.

The examination will assume a good working acquaintance with classical mechanics up to and including Lagrangian methods. In electricity and magnetism, it will cover steady and slowly varying currents and fields, but it will not assume that the student has had appreciable experience with potential theory using boundary conditions other than those involving plane or spherical surfaces. Although both electromagnetic and elastic waves may be included, the emphasis will be on principles that the student would normally cover in courses in physical optics, electromagnetic waves, *or* acoustics. Most of the items involving atomic physics will not go beyond the Bohr and vector models.

The cooperation of physics departments is requested in determining the degree of success of these examinations as predictors of performance in graduate school. Only data obtained after the administration of the tests can determine whether the subjective judgments that necessarily enter into test construction are sound. Individuals and departments that are willing to supply information based on their experience may communicate with any member of the committee or with Frank J. Fornoff, Educational Testing Service, Princeton, New Jersey.